WIND-BLOWN TREES.

From a Photo by F. M. SUTCLIFFE.

(Block kindly lent by Messrs. Seeley & Co., Limited.)

The

Amateur's First Handbook

of

Photography.

by

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Late President of the Liverpool Amateur Photographic Society.

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THE AMATEUR PHOTOGRAPHER'S FIRST HANDBOOK.

CHAPTER I.

THE SELECTION OF APPARATUS.

The first difficulty in the selection of an outfit is the choice of size for a camera. The following are the various sizes in common use, and to which, for convenience sake, it is wise to keep.

$4\frac{1}{4} \times 3\frac{1}{4}$ inches	..	Quarter plate.	For Cartes and Lantern Slides.
$6\frac{1}{2} \times 4\frac{3}{4}$,,	..	Half plate.	For Cabinet Pictures.
$8\frac{1}{2} \times 6\frac{1}{2}$,,	..	Whole plate.	
10 × 8 ,,	..		
12 × 10 ,,	..		

These sizes are those of the plates used, not the dimensions of the camera itself, which is, of course, larger in every way. The beginner may choose for experimental work a camera similar in pattern to Fig. 1, which is a simple form, useful for general work, and obtainable from several manufacturers at a cost, with stand and lens

complete, of about £2 2s. od. in the quarter plate, or £4 4s. od. in the half plate size.

It is strongly recommended that half plate size be chosen, as the purchaser of a quarter plate camera will soon find that his pictures are small, and therefore unsatisfactory, and if a light and portable make of half plate camera be selected it will weigh but little more than quarter plate. For landscapes the half plate camera is as large as can be conveniently carried any distance, and for

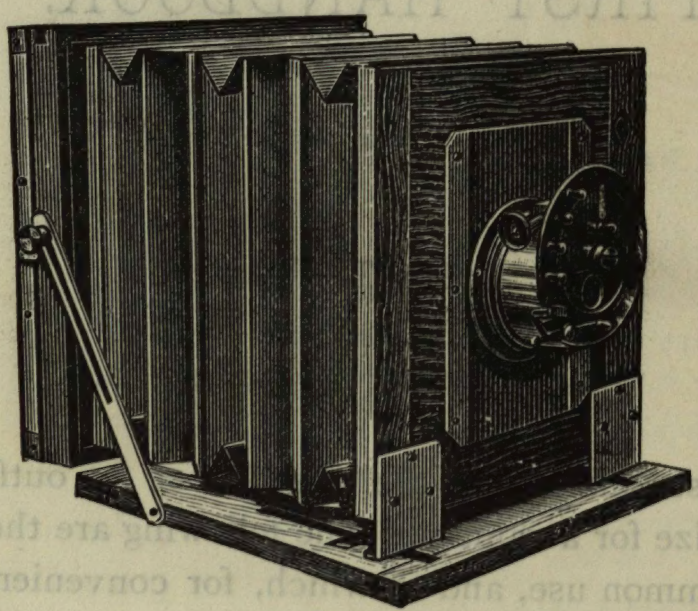


Fig. 1.

portraits is all that can be desired. Three double backs will be found useful, with a few carriers for holding quarter plates, for cartes-de-visite, experimental work, and lantern slides. The weight of the impedimenta of a whole plate, or 10 by 8 camera, makes photography a toil of a pleasure, if the scene of operations is far from home.

In choosing a camera for a permanency, and especially when of a large size, a pattern similar to the one shown open in Fig. 2, and closed in Fig. 3, will be found good and serviceable. It combines with the usual form of folding

camera an extra long extension of body, racking inward and outward, so that it is adapted for long or short focus lenses. A *really good* half plate outfit of this kind, including camera, lens, tripod, and the necessary small apparatus and chemicals, can be obtained for about £8 or £9. Buy nothing old-fashioned, and carefully avoid all "complete sets" at abnormally low prices, for however "cheap" they may be at the outset, they will be found dear in the end, and as a rule unsatisfactory throughout.

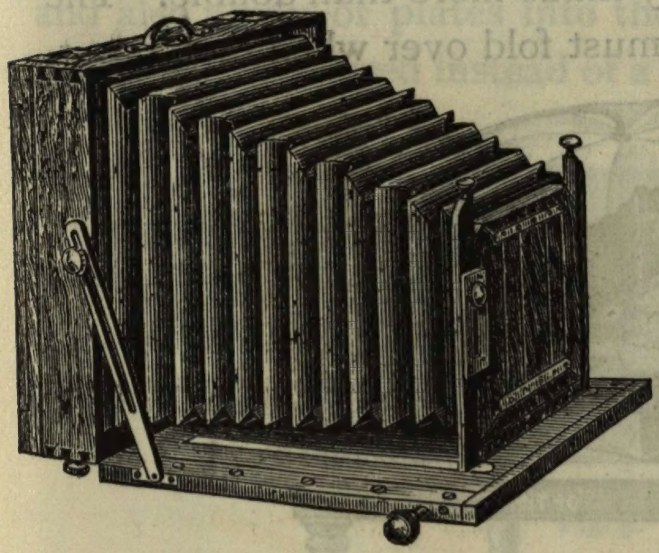


Fig. 2.

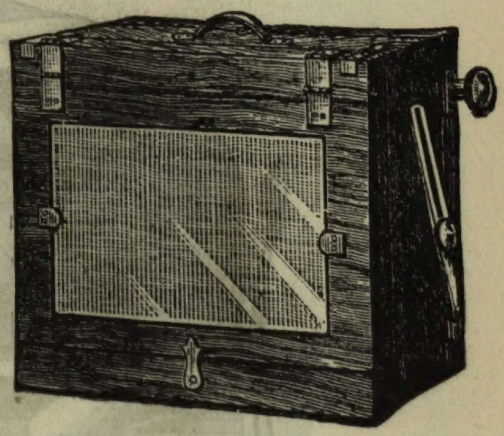


Fig. 3.

Whatever make of camera is chosen, the following points should be noted :—

The front should be separable, and, by screws or other means, rise and fall, and also move horizontally, with a range carrying the lens far enough to come opposite any portion of the plate. A square camera, with reversible back, so that upright or horizontal pictures can be taken at will, is the best.

The camera should have a swing back; that is, the back portion, in which the dark slides fit, should move from the centre, upright and horizontal axis, in and out, so as to make the distance from the lens greater at the top

than at the bottom, or at one side than the other. See also that, when these movements are made, you have the means of screwing the back tight and rigid in the desired position. A swing back is an absolute necessity, and no camera should be without it. The focussing screen should be hinged to the top of the camera, to fold over when not in use; many are lost or broken for want of this precaution. The length of the camera when extended should, if possible, be at least 50 per cent. more than the length of the plate used, though it is frequently made more than double. The shutters of the dark slides must fold over when drawn out,

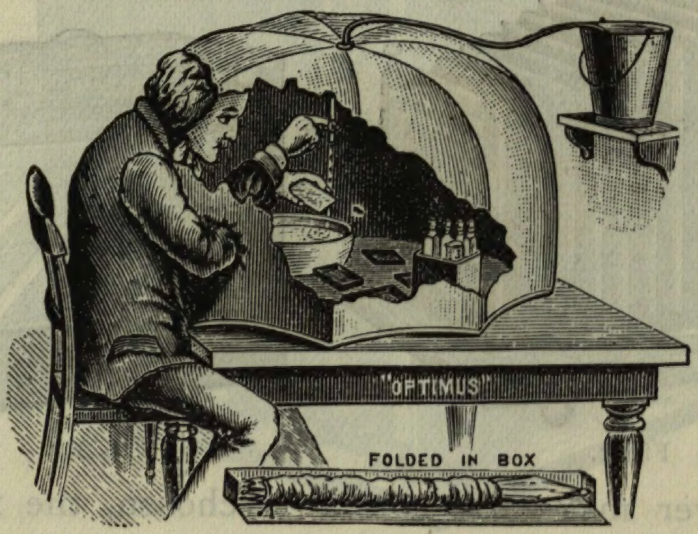


Fig. 4.

otherwise a slight wind during exposure is apt to shake the camera, and so blur the picture. Each slide should be numbered on each side, or confusion will occur as to which plate has been exposed. To focus accurately, there should either be a rack having a thumb screw at the side to work it, or a long screw adjustment working at the end of folding base board. This latter is the best, as least liable to get out of order, but is somewhat awkward for short-sighted or long-bearded individuals. For those who wish to expose a large number of plates in a day, I would

recommend a changing box or changing tent (Fig. 4) to those who can afford it.

An extremely useful and simple piece of apparatus, and one that can be made at home, is a changing *bag*. (Fig. 5.) It consists of a bag similar in form to a small pillow-slip, but made of two thicknesses of closely woven and perfectly dense cloth, with a sleeve, terminating in an elastic band, at each end. The opening in the sleeve must be large enough to admit of putting the dark slide, and also a box of plates into the bag. A changing bag of this kind can be used instead of a focussing cloth, and should

Fig. 5.

have a loop tape sewn on at one side to slip over the lens in windy weather. As the bag can be carried in the pocket, it is handier than the changing box or tent, and it can be used by placing it on any level table or wall, or even on the knees. The arms are inserted through the sleeves, first drawing up the sleeve of the coat or jacket, and letting it fall down again over the end of the sleeve of the bag, to prevent any possibility of light entering. Changing the plates by touch only is awkward at first, but it will soon be found that the film side of the plate is quite easily distinguishable.

Our next consideration is the lens. For ordinary landscapes, the single lens is as good as any, and by far

the cheapest. However, if the price can be afforded, by all means buy a rapid rectilinear of some well-known make.

The rapid rectilinear is a double combination, and works with a larger aperture than the single lens, and therefore by letting more light through, works much more quickly. These lenses are very useful for all purposes, and, though not so rapid as portrait lenses, are quick enough for any ordinary work. Portrait lenses proper, are for the amateur at least, now very little used. As will be seen later on, with a good light, the rapid rectilinear is practically instantaneous, and even in an ordinary room can be used in from three to ten seconds. If a portrait lens is wished, a French lens (which should be tried before being purchased) can be had cheap. For a long-focus lens, the back combination of the rapid rectilinear may be used, simply screwing out the front combination. This will give a landscape lens of twice the length of focus of the rapid rectilinear, and therefore requiring four times the exposure.

Next, the tripod stand. There is a large number of different makes, and most of them are good. Try your stand before purchase if possible. Set it out firmly on the ground, place your hand upon the top, and see if it be rigid enough, no vibration, no weakness. The cost varies from 10s. 6d. to 30s., weight from 1 lb. to 4½ lbs. Do not buy one heavier than this.

Some stands are rigid, Alpenstock fashion, some folding, as Fig. 6, and some with both sliding and folding arrangement, which enables a large tripod to close into small space, as Fig. 7. The stands with sliding legs are best, as on rough ground and under many conditions the sliding

arrangement enables the operator to adjust each leg to the circumstances, without altering the position of the camera, and for interiors of churches, when often one leg is on a

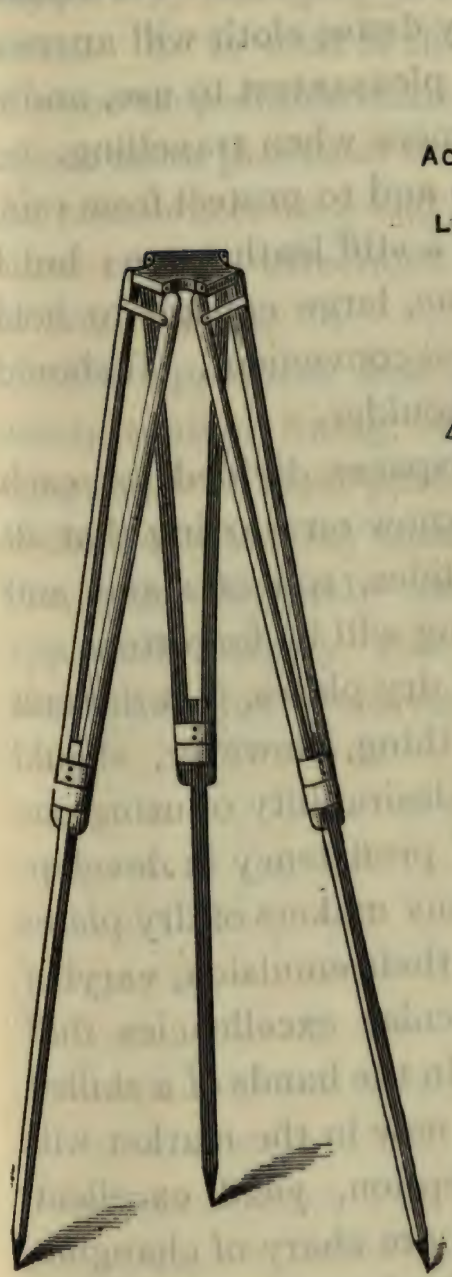


Fig. 6

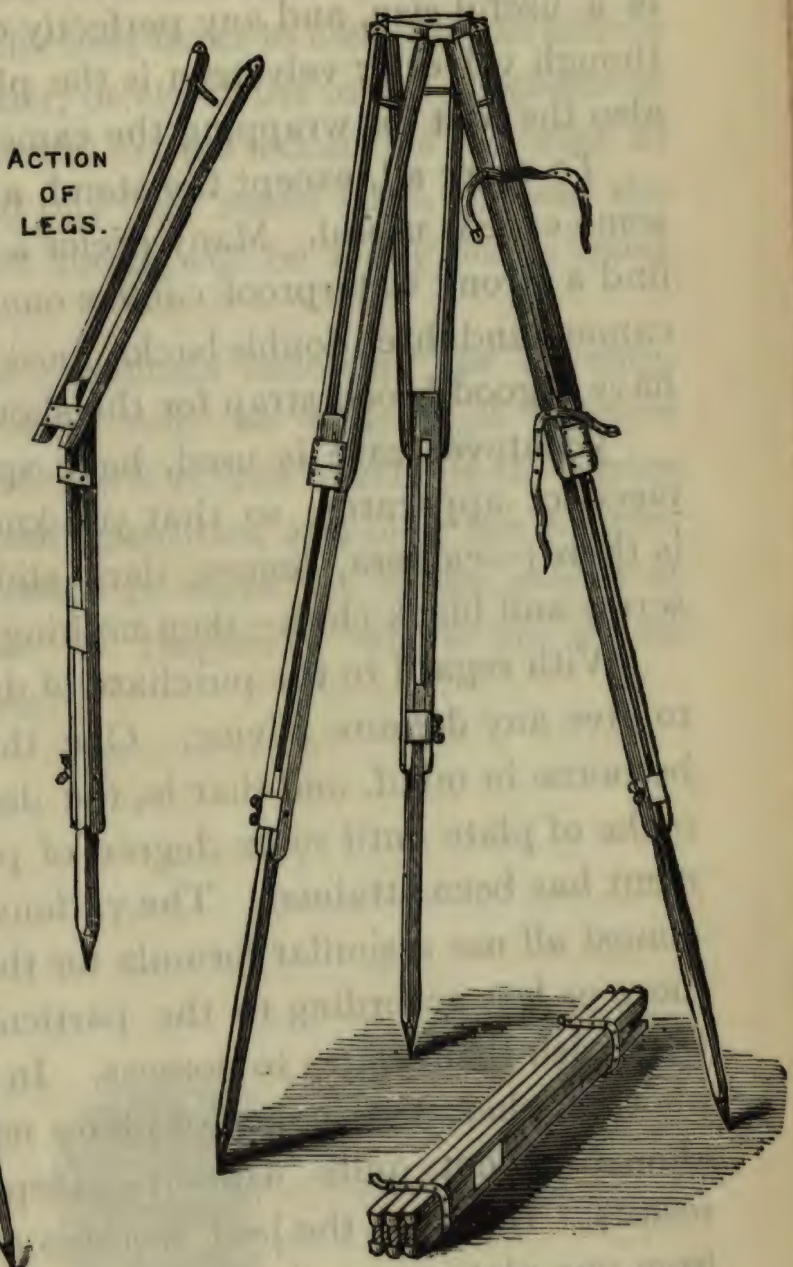


Fig. 7.

seat and the others in a pew behind, such a stand is almost indispensable.

The focussing cloth to cover the head while focussing must be mentioned. If a changing bag, as before mentioned, is carried, no other cloth will be needed. The

focussing cloth should be large enough to cover the camera, and the head and neck of the operator, and meet underneath. For quarter or half plate, about three feet square is a useful size, and any perfectly dense cloth will answer, though velvet or velveteen is the pleasantest to use, and is also the best for wrapping the camera when travelling.

To carry all, except the stand, and to protect from rain, some case is useful. Many prefer a stiff leather one; but I find a strong waterproof canvas one, large enough to hold camera and three double backs, most convenient. It should have a good broad strap for the shoulder.

Whatever case is used, have spaces divided for each piece of apparatus, so that you know on starting that all is there:—camera, lenses, dark slides, top of stand and screw and black cloth—then nothing will be forgotten.

With regard to the purchase of dry plates, it is difficult to give any definite advice. One thing, however, should be borne in mind, and that is, the desirability of using one make of plate until some degree of proficiency in development has been attained. The various makers of dry plates almost all use a similar formula for their emulsion, varying more or less according to the particular excellencies that they wish their plates to possess. In the hands of a skilled photographer, the makes of plates now in the market will almost, if not quite without exception, yield excellent results. But even the best workers are chary of changing from one plate to another, and the beginner should rigidly adhere to one make until he knows most thoroughly the characteristics and capabilities of that make and of his developer. If you do not obtain good results, do not listen to friends who tell you that they are always successful with some different maker's plate, and wish you to condemn the

one that you are using. It is more likely that you are to blame than that the plate is; and you are more likely to improve by changing your methods than by changing your plates. As to what is the best make to use, take the advice of some respectable dealer, or else trust to the judgment of others more practiced in the art (as indeed for all else at the commencement) and buy only small sizes, for with the most explicit directions there will be many plates spoilt at first.

The apparatus and chemicals necessary for development, toning, fixing, &c., will be treated of in later chapters. In their purchase it is well to rely on the advice of the dealer. Buy small quantities, and only the articles that you absolutely need, as there are many pieces of apparatus largely sold to beginners which are of no practical value whatever.

CHAPTER II.

THE DARK ROOM AND ITS CONTENTS.

As the action of light upon the sensitive plate is the very basis of photography, and as it is necessary to protect the plate from any light except that which comes through the lens from the object photographed, a "dark-room" for changing and developing the plates is a necessity. The position of the room is of no moment, so long as it is large enough to work in, dry, and capable of ventilation. The window may be filled in with ruby glass, or with "canary" paper, a dense paper of a chrome yellow colour, or with "canary" fabric, a special yellow cloth. A very pleasant light is obtained when a sheet of ruby glass and the canary fabric are used together, or canary and "cherry" fabrics. The employment of these media will not render the room really dark, but as the blue and violet rays in ordinary light are the only ones that are chemically active, the light that shines through the red or yellow medium does not affect the plates unless they are exposed to it for a very long time. If the window is very large, it may be partially blocked up with thick brown paper and only a small space left for the translucent medium. If the window is exposed to direct sunlight it should be screened on the outside, or an extra sheet of medium stretched on a frame or used as a blind should be provided as an extra precaution during sunshine. The doors and all other openings where light can penetrate must be carefully covered.

If there is no window to the dark room, or if, as most amateurs must, you intend to work in the evenings, a lamp with non-actinic glass will be required. Figures 8 and 9 show ordinary patterns of ruby lamps, to burn mineral oil, and costing from 3s. upwards.

There is also one made from a hock bottle, fitted up so as to burn a candle; it is safe, handy, and economical, costing about 2s. 6d.

Mine is made of a four-sided ship's lamp, with two sides replaced by dark ruby glass, the others by deep orange.

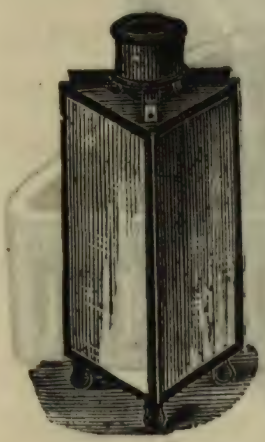


Fig. 8.

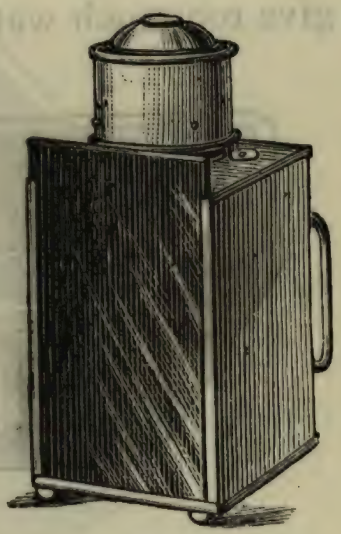


Fig. 9.

This throws a flood of light into the room, and enables the operator to see where his chemicals are. The light through the ruby glass sides only falls on the plates during or before development, and does no harm, nor does the yellow light when reflected from the walls of the room, though it would if it fell direct upon the plates. Let the eyes be protected from the direct rays of the lamp; you will then be better able to see the effects of development. See that no white light escapes through the fittings.

If possible, a good water supply and sink should be provided in the dark room, a vitrified enamel stoneware

sink, with overflow plug that will allow it to be kept full nearly to the top but without running over (fig. 10) is decidedly the best. If no town's supply is available, any large jar or trough, with a syphon tube and tap depending can be made to answer for the supply, and a bucket may be placed under the sink to receive the waste. In such an arrangement, great care must be taken to keep the water supply perfectly clean.

In this case it is better to complete all the final washings where a more plentiful supply may be had, as it is difficult to give too much water to a negative after fixing, when the

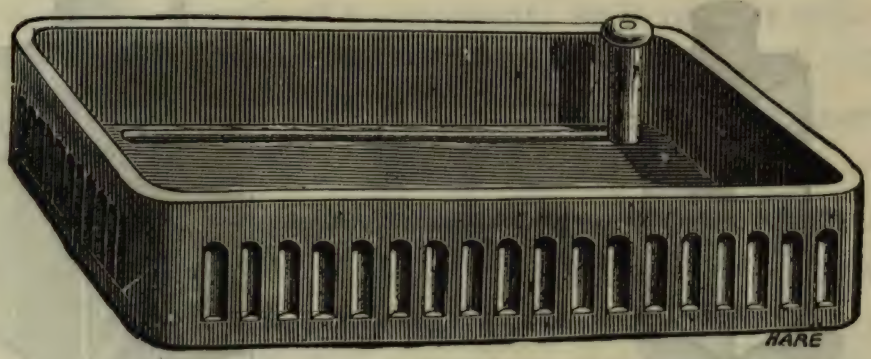


Fig. 10.

light has no further action upon it. For this purpose, a washing trough, fitted with grooves for containing the negatives, can be had at a very moderate price, and in it you can place all your developed negatives under the water tap on the sink in a back kitchen, leaving it to flow all night without any danger of injury; then your negatives will be perfectly washed by the morning. The plate washer here represented (Fig. 11) is cheap and effective, and has the advantage of being kept in stock by the majority of dealers. The outflow by syphon is preferable to a tap outflow. If the force of the incoming water is too great for safety, as when the cistern supply is of great height,

a piece of india-rubber tubing over the tap, of larger dimensions than the tap itself, will prevent injury to the soft gelatine film of the negative.

For development, trays of the requisite size are to be had of ebonite, papier maché, porcelain, metal or wood. The economist can make them of either of the two latter materials, and, if well black-varnished, they will answer

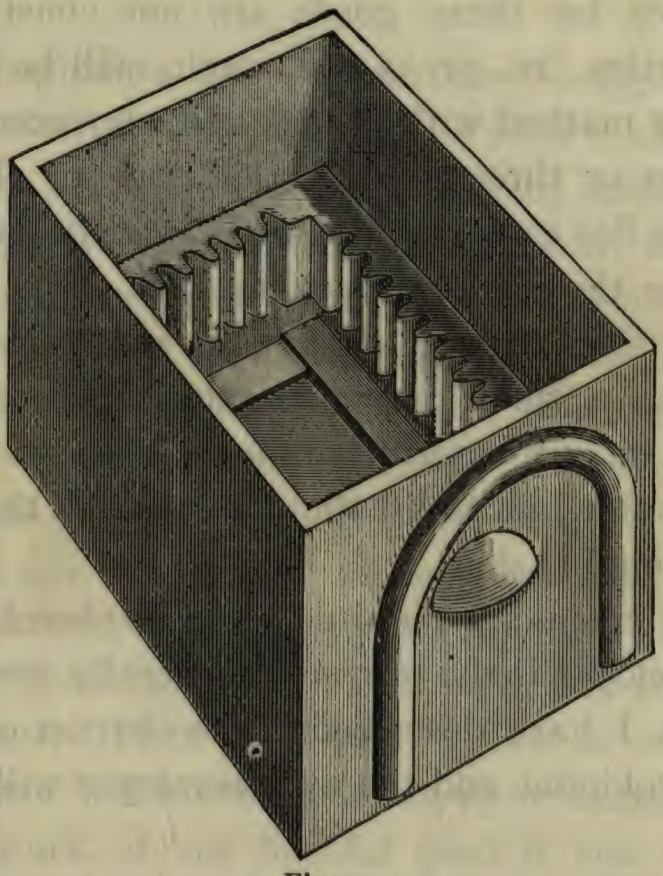


Fig. 11.

very well. Ebonite, or papier maché, are the best, but the former being breakable, must be used carefully. I have four in use, one for development, two for fixing, one for clearing. For these two latter operations, the old baths and dippers, such as were used for sensitizing wet plates, are luxurious, and act better by a greater change or motion being given to liquid, but they are more expensive to buy, though metal ones can be made at a trifling cost.

Of chemicals, the following will at first be sufficient; larger quantities may of course be purchased, as all except the pyro will keep.

1 oz. Pyrogallic acid.
1 oz. Ammonium bromide.
2 oz. Liquor ammonia ·880.
1 oz. Citric acid.
1 oz. Powdered alum.
1 tube Chloride of gold.
1 oz. Sodium bicarbonate.
1 oz. Sodium acetate.
2 lbs. Sodium hyposulphite.

The prices for these goods are not constant. Two dropping bottles, 1s. or 1s. 6d. each, will be useful. A 2 oz. measure marked with drams, and a few common cups, pint jug, two or three pint bottles, two or three 2 oz. bottles, and a flat camel's-hair brush, one or two inches, will complete the necessities of the dark-room, unless the operator is wishful to save his fingers from being stained slightly, when a small curved ebonite hook, made for the purpose, can be purchased from the dealers for a few pence, which will enable him to lift the plates out of the solutions without wetting his skin.

I give the chemicals required for pyro development, as the pyro developer is the one most generally used, and is the one that I have described in the chapter on development. Hydrokinone and the iron developer will be treated later.

And now before inserting the plate in the slide, brush it lightly over with a soft, clean cloth, or a camel's-hair brush, as each speck of dirt will cause a flaw in the negative. Be careful to place the prepared or dull side of the plate towards the draw shutter, and when closing the dark slide see that it is properly fastened by the catches attached, as, if the smallest trace of light gets in, it spoils all.

CHAPTER III.

THE SUBJECT.

Most beginners, I fancy, practice on figure studies—a friend or relative, who wants to be immortalised. This is a mistake. Don't get into bad repute by confessing failure; therefore practice on any inanimate body, whether house or landscape, and you need not show results unless you like. In figure studies also, much depends for the best results upon the lighting, and this requires more study than you have at present given. Practice at home, photograph the backyard, the outhouse, the other side of the street, anything, until you know (as after the exposure of a few plates I trust you will know), that you have learnt the right time to give, and also the right mode of development. Then take your friends in or your camera out, and you will come back happy in anticipation. For out-door work, if not bashful (and if you are, you had better get over it quickly), you need not go far for a picture. There are few villages that have not a picturesque corner, few lanes without attraction, few fields without a tree, a pit, or a broken fence. The grandest subjects give frequently the worst results. A corner, a little bit of wood and water, that an Alpine tourist would pass unnoticed, will often give you a picture to be proud of. I cannot, in this short space, give directions how or where to find subjects. If you have no artistic training, nor the taste

which forms the artist, look at the work of others and go and do likewise.

In photographing figures, a plain background is the best universal one. You can make a very good one with a blanket, or of a sheet of brown paper, which can be bought five feet wide and any length required. This nailed up against a dead wall, or hung on a pole, is first-rate. If you can afford it, buy a proper one, made of flexible material, such as the "Professional" background cloth, which can be had from any dealer in photographic materials, in a variety of tints, and to almost any dimensions. Avoid fancy painted backgrounds, unless you are going in for a properly and fully fitted studio, and then you may indulge in such if you wish. A garden always supplies a good background. Ivy, trailing plants, a tree, the doorway in a greenhouse, all can be brought into requisition; but if you have a brick wall, cover it up somehow.

Indoors, good pictures may be taken, but, for want of space, the features are often distorted because you are obliged to bring the lens so near the figure.

Avoid horizontal straight lines, upright ones you cannot, but these must be properly distributed or they will spoil the result.

There is no reason why amateurs should not produce as good work as professionals, even on their own ground—but the ground must be prepared by study.

If groups are attempted, don't let all stand in a row; the centre figure should be the highest (or one near the centre), and the outside one lower than its neighbour, the others as far as possible taking the pyramidal form. More minute directions would only confuse. Consult a book of good

engravings, and you will get hints enough for many pictures from better masters than I.

If you wish to study thoroughly the artistic side of photography, read such works as "Picture Making by Photography," and "Pictorial Effect in Photography," both by Mr. H. P. Robinson, or Burnett's "Art Essays," and learn as much as you can from general art literature and art periodicals.

For properly lighting a sitter in or out of a studio, I cannot do better than quote from a pamphlet issued by M. Klary, of Algiers, in which he describes a system of lighting the sitter, adopted in many American studios, by means of a coloured head-screen and a reflector, avoiding the necessity for blinds or curtains. A condensed embodiment of M. Klary's system, from which some valuable hints may be gained, is as follows :—

"Light and shade giving us all our effects in photography, it is necessary that they be balanced in accurate proportions; that the time of exposure be sufficient to reproduce the best effects of the lighting, and that the development be adjusted according to the exposure. It is important that the lighting of a face and figure should be balanced in such a way, that the contrasts may not be simply *black* and *white*, but a soft gradation of all the intermediate tones, so as to produce an artistic picture.

"Of the three lights used in the studio, the *diffused* may be employed in the greater quantity, the *reflected* must be more restrained, and the *direct* used most sparingly and judiciously. The position of the sitter should be *under* the principal or strongest light. It is best to employ a soft and slightly diffused light coming in due proportions from the top and side. This is readily obtained by use of a

head-screen, which should be placed by the side of the sitter, nearest to the light, and of course outside the focus of the desired picture. It must be elevated above the head, raised or lowered and turned to the required angle, until the operator observes the true and best effect upon the shades and lines of the face. There will now be seen a generally diffused light over the whole of the figure, but a little predominant on the side nearest the light; if the eyes are sunk deeply, lower the screen a little and move it slightly towards the shaded side of the face; it will thus increase the top light and bring the face into bold relief; the shaded side, though slightly darker than the other, will remain soft and full of detail.

"It is necessary to soften the edges of the shadows, in case of need, with a pure and delicate reflected light, this is done very readily by means of a reflector. It should be of the concave form turned towards the sitter in such a manner as to throw a concentrated light upon that part of the face under and behind the eye, as well as the darker portions of the neck; you will thus avoid the spot of reflected light appearing in the eye.

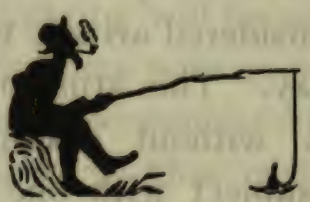
"For lighting *a la Rembrandt* do not change the position of the face, but move your camera so as to obtain a view of the other cheek, and with some slight modifications of the head-screen, this lighting will be as perfectly rendered as the other. It is not here necessary to use the reflector, the head-screen alone will regulate the top light, which must be used sparingly, so that it does not fall upon the points where the middle tones are wanted."

When out afield, having selected your subject, see that the stand is firm on the ground; if on a smooth surface it may slip, if on a soft soil it may sink; see to both chances,

and that the camera is firm on the stand. Next throw the black cloth over the camera and over your head, take the cap off the lens, and screw out the apparatus until you find the image upside down, coming up sharply with every detail visible; then take a magnifier and see that it is perfectly sharp, microscopically so. If a figure, focus for the eyes; if a landscape, the middle distance; use the magnifier in the centre of the picture (it will probably not be sharp all over until the stop is inserted). Now see that the camera is perfectly level in each direction; if not so, that is, if pointed downwards or upwards, the picture is distorted, and the walls of any building will not be parallel but running to a point in a most distressing manner. If the subject be a tall building, or if the foreground is obtrusive, raise the front containing the lens until the foreground is removed, or until the top of the building is visible on the plate. If the subject is a church or tall tree, or anything tall and not very broad, it is well to use the plate in an upright position, either by turning the camera on to its side, or by using the reversing back. As in an ordinary landscape, focus for the middle distance, then use the swing back so as to slightly increase the distance between the lens and the upper portion of the glass—by this means you will get the foreground as sharp as the rest.

It is frequently considered artistic to have the distance out of focus and hazy. The atmosphere in this country generally effects this without making it so purposely. Always look at your subject with one eye only, thus you get a better idea how it will look when imaged by the one eye of the lens. Many bits which look extremely pretty with both eyes, or in the stereoscope, which is identical in result, are very tame as a single picture.

And here a few words on the lighting of the view will not be out of place. Never take a landscape with the sun or bright light shining directly into the lens, or fog will result. It is best to work with a cross light from one side, but avoid, if possible, a strong cross light falling between the lens and the subject. Buildings are best photographed when the sun is high. Landscapes almost at any time of the day. Trees and foliage frequently show best when illuminated by a low evening sun, when the shadows are long and the trunks well lit. Distances, if at all lost in mist, will be probably lost altogether in the finished print. Trees in leaf, when there are deep shadows, will very frequently be taken with best advantage without sun, and there is also less chance of wind, and for perfect results with close distance it is necessary to avoid the least suspicion of this, though on large distant views, wind has little or no effect.



CHAPTER IV.

THE EXPOSURE.

Having selected and focussed your picture, whether figure or view, see that the screws are tightened, fold over the ground glass and insert the slide containing the plate, fasten in its place with catch, draw out the shutter; cover all over with the cloth, and by taking the cap off gently and quietly, expose—for how long? The lens maker gives you no information; the plate maker confuses you. If you ask him he tells you his plates are twenty times as quick as wet plates; but as nobody knows, or cares to know, how quick a wet plate is, you are not very much wiser. Then he says they are instantaneous. What does that mean? I have one lens I can take a picture with in a $\frac{1}{250}$th of a second. Is this instantaneous? No. Yet I can take moving objects with a rapid rectilinear, the shortest exposure with which to get a good picture, is $\frac{1}{50}$th of a second, and I have taken children playing in a $\frac{1}{4}$ of a second. Then, says the maker, cap off and on. With what lens? And you get no satisfactory reply; and until makers are forced by public opinion to mark their plates so that any one who buys may know how quick they are, so long will this uncertainty last. But, even when the speed of the plate is known, the exposure will depend entirely on the lens, the stop, and the light—three varying quantities. I will devote this chapter to directions as to finding the relative exposure

necessary for various subjects, taking into consideration the lenses you may have, the amount of light, the plates, and other varying conditions.

To illustrate the mode of calculation of the former, we will suppose that the lens is one of 5-inch focus, and if a rapid rectilinear, or symmetrical, or other lens of this type, it is always supplied with a set of diaphragms (or stops) of various central apertures smaller than the opening of the lens, to be inserted as required. Now take each stop and measure the opening accurately. We will suppose that these are four, measuring $\frac{1}{8}$th, $\frac{3}{16}$th, $\frac{1}{4}$, and $\frac{1}{2}$ inch. Divide the focus, 5-inches, by the size of the stops, $\frac{1}{8}$th, &c. $5\text{-}\frac{1}{8}=40$, or *f*/40, as is generally called, meaning that the focus divided by 40 is the size of that particular stop. The next yields 27 nearly; the next 20; the largest 10. These stops are therefore *f*/40, *f*/27, *f*/20, *f*/10. As these figures represent the diameters of the stops, to obtain the relative amount of light which passes through each aperture, the figures must be squared. $40\times40=1600$, $27\times27=729$, $20\times20=400$, $10\times10=100$. These figures represent in inverse ratio the speed with which, under the same circumstances, an exposure may be made. Thus, if the largest stop requires one second, the next will require 4 seconds, the next 7, and the smallest 16. If you make a list of these, and keep it for reference, you will never be at a loss.

Now as a general rule, and as a guide to those who have never before exposed a plate, I may remark that *f*/40, that is a lens with a stop $\frac{1}{40}$th the length of focus, will require an exposure of two seconds with an ordinary plate on a landscape bathed in sunshine, but as the rapidity of each make of plate and the development varies, that standard must not be relied upon permanently, but let each test for

himself whether with the particular plates he uses this be right or no. Do this after practising on a few plates to get accustomed to the development. Proceed as follows: Insert a plate as before directed in the camera, but instead of pulling the shutter out fully, draw it out only one-third of the length, and expose one second by taking the cap off for that length of time; then when the cap is on again, draw out the shutter for another third of the space, and expose that portion for another second; then again for another after pulling out the shutter to its full extent. You now have a plate exposed three seconds, two seconds, and one second. This is then carefully developed, and when complete you can judge which is the portion best exposed, and this made a note of will be a guide for future work. Of course, if the lens is slower, if the stop be small or the focus long, or if in any way the F, as mentioned above, is divided by a greater number than 40, then you must increase the exposures to 2, 3, 4, or 3, 5, 7 seconds, or whatever the proportion of these dividers when squared may be; also the experiment must be made under the same conditions of light, namely, sunshine (unless you have thoroughly mastered the next chapter).

Having fixed this one exposure as right, we will say, still for argument's sake, that you find the middle portion, which had two seconds, is the most brilliant, and at the same time, is full of detail and prints best, calculate now the time necessary for the other stops, and, if you have them, for other lenses and their stops. It is all a question of simple arithmetic, nothing more—thus, *f*/40, or squared 1600, takes two seconds, what will say *f*/10 take? Square 10=100 and say as 1600 is to 100, so is two seconds to $\frac{1}{8}$th. And you know, therefore, that the lar e stop

represented by *f*/10, will, *under the same conditions*, take $\frac{1}{8}$th, when the smaller requires two seconds, and so on with all other stops and lenses. Now make a table in your note-book for handy reference, thus:—Mr. Blank's lens 5-inch focus.

Stop 1 = *f*/10 = $\frac{1}{8}$ sec. Sun.
" 2 = *f*/20 = $\frac{1}{2}$ "
" 3 = *f*/27 = 1 "
" 4 = *f*/40 = 2 "

You have now data to go upon which, if the light itself was always fixed, and you always worked out of doors, would be all that is required; but, unfortunately, clouds will intervene and shadows creep on one unawares, that it is often impossible to have any idea as to how much actinic light is left to illuminate the view or the object to be imaged. A practised photographer can judge by his experience and by the appearance of the image on the ground glass how long to give, but at best this is only an accurate guess, and the beginner cannot hope to succeed without a few preliminary failures.

Now as to the light at different times of the year. In May, June, July, and August we have the best actinic light, and therefore in these months you may give the shortest exposures; in March, April, September, and October, the light being less actinic, you may double that exposure; in January, February, November, and December, when the light is weakest, you may treble the exposure. You must also bear in mind the hour of the day, thus, from 9 a.m. to 4 p.m. in summer, and from 11 a.m. to 2 p.m. in winter, you may calculate upon having the best light, before or after these hours you may safely double the time of exposure.

Next as to dry plates:—I must explain that the principal

makers have adopted as a standard for testing them, a sensitometer, which is so devised that under normal conditions it registers upon the plate tested *a number* which denotes the sensitiveness in various degrees, ranging from No. 1 (the lowest) to No. 25 (the highest); by this test we may consider a plate registering from No. 1 to 10 as being of *ordinary* rapidity (comparatively slow), from No. 10 to 15 as being *rapid*, from No. 15 to 20 as *extra rapid* and from No. 20 to 25 as *instantaneous*, *i.e.*, suitable for drop shutter work.

The following table of relative exposures for various subjects, based upon the foregoing instruction and practical experience, will serve as a fair guide to the beginner, although it must not be taken as an *absolute* one. In compiling it I take a rapid rectilinear lens, using the first (or largest) diaphragm, which is the full aperture, working at *f*/8 in a noonday light at midsummer, and from this I calculate approximate exposures necessary upon extra rapid and instantaneous plates of any good make.

SUBJECT.	IN SUNLIGHT		IN DIFFUSED LIGHT.	
	Ex. Rapid.	Instants.	Extra Rapid.	Instants.
For Sea Views and Sky....	¼ sec.	1/50 sec.	½ sec.	1/20 sec.
An Open Landscape.....	1 ,,	¼ ,,	2 ,,	½ ,,
Do. with foliage and light-coloured Buildings	2 ,,	¾ ,,	4 ,,	1½ ,,
Do. with Dark Buildings..	4 ,,	1½ ,,	8 ,,	3 ,,
Woods, and heavy Foliage	8 ,,	3 ,,	15 ,,	5 ,,
Figures, or Groups, outdoor	4 ,,	1½ ,,	8 ,,	3 ,,
Portraits in a room with good window.....	8 ,,	3 ,,	15 ,,	5 ,,
Interior Views of ordinary rooms.....	5 min.	2 min.	15 min.	5 min.
Interiors of Churches, &c.. with stained glass windows	30 ,,	10 ,,	1 hour	20 ,,

An open, *distant*, landscape or sea view, will take but half the time of a *close* one. A near view, all foreground,

and perhaps composed of nothing but foliage will frequently take longer than the standard here given.

For judging the actual actinic power of the light in any individual case, no rule can be given. The use of an "actinometer" is sometimes recommended, but I have always found that a beginner will learn to judge the light by eye in much less time than it will take him to learn to use the actinometer properly.

When you have your note-book and the above table to refer to, and have learnt from experience to guage the power of the light, there is no reason why, with care, *every* plate should not be correctly exposed. Once master this thoroughly, and more than half your troubles are over; for the bulk of the annoyance, trouble, and loss connected with photography is dependent upon either under or over exposure in the first place.

CHAPTER V.

THE DEVELOPMENT.

This is perhaps one of the pleasantest operations to the enthusiast, if there is the expectation of good results, which ought always to be the case.

Each box of plates sent out contains full instructions as to the solutions required and their use, and, as a rule, it is better to follow them closely. These vary so much that I cannot well criticise them here, nor do I wish to do so. Each maker ought to know best the treatment his own plates require in order to produce the best results; and it by no means follows that the development which is eminently successful for one class of plates will do for another. I can, therefore, only give the plan I have myself adopted, and by studying the reasons given, the reader will learn how to adapt its principles (not its details) to the mode he may have to employ with his own plates.

The chemicals in common use are pyrogallic acid (generally known as pyro.), ammonium bromide and liquor ammonia. You may find these under various names, and in various qualities, as is the case with most chemicals, thus bromide of potassium is called potassium bromide, carbonate of soda is sodic carb., and so on. The purchase of these substances from reliable houses will overcome any difficulty on that score, and one bit of advice I must add—always buy the *purest* chemicals obtainable, and never

be tempted with the cheap if you wish to produce good results in your work.

The pyro. can be kept either in its solid form or in solution. The latter may be in alcohol or water.

(A) Add to 1 oz. of pyro. 5 ozs. of alcohol (methylated spirits), and when dissolved add 1 oz. of glycerine, and well mix :—or

(B) Dissolve 40 grains of citric acid in 6 ozs. of water, and then add this to 1 oz. of pyro.

In each case you have 1 oz. of pyro. dissolved in 6 ozs. of solution, and therefore 1 grain of pyro. is contained in 6 minims of solution, or 1 dram of solution holds 10 grains of pyro., thus you can measure out easily any required quantity. I may here mention that a drop of a water solution is nearly equal to 1 minim, but that a drop of an alcoholic solution is equal to only half a minim, and that a drop of the same material is always the same size, let it come from a wide or narrow opening. This is worth remembering.

I prefer myself to keep the pyro. in a solid state, and weigh out the quantity as wanted ; but this is entirely a matter of choice. Pyrogallic acid will not keep indefinitely, in the solid form it discolours, also in glycerine and alcohol, while in water, it is least reliable for a lengthened period, though best for a short one. The bromide should always be kept in solution. I use 120 grains to 1 oz. water. The ammonia is best diluted with an equal quantity of water.

To commence, mix sufficient pyro. for as many plates as you are likely to develop at once, it saves time. For a quarter plate or 5 by 4, take 1 oz. of water, 2 grains of solid pyro. (or 12 minims of solution), and 1 drop of bromide (containing $\frac{1}{4}$ grain), mix this in a measure. Take the plate

out of the slide and lay it face upwards in a tray and pour over it the mixture from the measure. Take a large camel-hair brush and pass it gently over the plate to clear away any air bubbles that may stick to it, and see that the whole is well covered by the developer; if it is not, use more of the same solution until it is. Pour back the solution from the plate into the measure, add one drop of ammonia, and pour back, but this time and afterwards it must be poured on with a sweeping motion, commencing at one corner of the plate and carrying it quickly on to the opposite end, at the same time tilting the whole so as to allow the solution to flow rapidly over the plate. If this is not carefully done, the developer acts on one part of the plate, while the other is left free, and thus lines occur which do not add to the beauty of the picture. Then wait awhile, rocking the dish so as to keep the solution in constant motion; if no change occurs in a few minutes, or if only the high lights show up as a grey patch, such as the sky, add another drop or two of ammonia, mixing and flowing over with the same precautions as before, and repeat this as often as necessary, adding for every three drops of ammonia 1 drop extra of bromide. If the plate is rightly exposed, 8 or 10 drops of ammonia will be found to be enough to bring out all details and full density.

You will find the plate gradually going darker in the portions which first appeared, then details will come where it was white, and at last it will appear to veil all over, and you will only with difficulty see an image at all. Now lift it out of the tray and hold it up to the ruby light. It ought to appear very dark, almost opaque, except here and there, and a trace of the picture, especially the highest lighted portions, may be visible at the *back* of the plate, if this is so, it is done.

If you find it still thin and you can see all the details plainly all over the plate, it is probably *over* exposed. In this case, throw the developer away, and without washing, add at once a fresh lot of pyro., and let it act until density be obtained. It may be necessary to add another 2 grains of pyro. to the solution to strengthen it sufficiently.

Another condition of the plate is *under* exposure, when the sky or high lights grow dense before any details beyond the most prominent show up at all. In this case add an equal amount of water and more ammonia to the developer in the measure; this will prevent the plate getting too dense, while it allows the ammonia to bring out details, then, when all details come up, but thin, add more pyro. to give density to the whole.

If, again, when the first dose of ammonia is added, the image flashes out quickly *all over*, it is evident it has been much over-exposed, throw the solution away and pour on, as I said before, some pyro. and bromide, doubling or trebling the quantity, if necessary, adding ammonia very cautiously.

Note this.—Pyro. intensifies, ammonia develops, bromide restrains, that is, keeps the shadows clear. Therefore an under-exposed plate requires more ammonia, an over-exposed plate more bromide. In the first case, the pyro. is lessened to give the ammonia more time to act; in the second place the pyro. is increased to get density before the ammonia has time to bring out too much detail. Too much density and too little detail, shows a want of exposure, and makes a hard or black and white picture. Too much detail showing over-exposure, makes a flat picture.

If you study the foregoing remarks thoroughly, you will have mastered the principles of development, and be able

to control it so as in most cases to produce good results.

A restrainer more powerful than bromide, and one which is often useful, is citrate of soda or of ammonia. If you add to the developer, when the plate is evidently much over-exposed, a solution of this salt containing an amount equal to the amount of ammonia already in the developer, it seems to stop the action of the latter, and allows only intensification to proceed, but no development of detail. This is an immense advantage. Thus, take of the citrate 1 oz. and dissolve in 6 ozs. of water, then you would have to add 3 drops or minims to every drop of the ammonia which has been added to the developer, then more pyro. and more ammonia and citrate may be added to intensify. Whatever means you adopt to secure density, do not stop the development until the plate is as dense as you wish it, or you will have to resort to intensification, which should be avoided if at all possible.

Hydrokinone, an aniline product, analogous in some respects to pyrogallic acid, was suggested as a developer many years ago, but as the price until recently was prohibitive, it is only lately that it has been at all generally used. Hydrokinone is supplied commercially in the form of very small crystals, which are not so soluble in water as pyro., but which keep well either in their dry state or in a plain aqueous solution. With hydrokinone no restrainer is needed, and the negatives produced are of a clear blue colour, which is preferred by many people to the brown colour of the pyro. negatives. A simple hydrokinone formula is :—

Hydrokinone	**2 grains.**
Water	**1 ounce.**

To which add two or more drops of ammonia 880, or a few

drops of a saturated solution of common washing soda. The development is not so rapid as with pyro. and ammonia. A very favourite hydrokinone formula, but much more complicated than the above, is the one published by Messrs. R. W. Thomas & Co., Limited, which will be found amongst the formulæ at the end of the book.

Many may prefer to develop by ferrous oxalate. This plan avoids almost entirely the thoughtful watchfulness necessary in ammonia development. This process will be found in the chapter under heading "Magic Lantern Slides," but with negatives the operation may be continued further, in accordance with the directions just given for pyro. development, as the veiling of the plate—so detrimental to a transparency—is not of so much consequence in a negative when density is of the greatest importance. A longer exposure is necessary in the first place, as the ferrous oxalate is not so energetic as pyro. and ammonia.

In developing photographs of interiors use the pyro. diluted with about 50 per cent. of water, generally treating the plates as if under-exposed. In some few cases, where the plate is known to be much under-exposed, it may be soaked for a minute or up to five minutes or more, according to circumstances, in a weak solution of ammonia alone, two drops to the ounce of water, after which wash under the tap. No apparent effect is produced, but the image will come up better when the ordinary developer is poured over.

A dodge I have found extremely useful while developing interiors or views containing large dark patches, such as spaces under overhanging trees, or portions of a building in heavy shadow, is to take a much stronger solution of ammonia than that used in the developer, say three or four times as strong, and with a brush dipped in this, paint over

the undeveloped part, tilting the ordinary developer away from that portion for a few seconds, then rocking the dish again in order to prevent the formation of lines around the attacked part. This plan frequently brings up detail in the shadows that would otherwise be lost, except at the expense of the remainder of the picture. Ceilings of rooms and churches can thus be shown which otherwise would be but a black mass, as the light is generally low.

CHAPTER VI.

FIXING THE NEGATIVE.

After the development the negative must be well washed, to free it from traces of the developer, which, if left in, would stain it; three or four minutes are generally sufficient for this in running water, or with frequent changes of water for a longer time. Now, read again the printed directions enclosed with your dry plates and you may find it to be necessary to soak the plates in a strong solution of alum, to harden the film. Some qualities of gelatine films frill (or soften and expand) during the final fixing, and leave the plate altogether; to avoid this, alum is used to harden them and so prevent the evil. Depend upon it, if the maker says it is necessary, it is not wise to dispense with this precaution. Again, well wash and place the plate face upwards in the fixing bath, in a solution of 4 ozs. of hyposulphite of soda in 1 pint (20 ozs.) of water (a teacupful of hypo. is about 4 ozs.) Leave it in this until all the white portion of the plate, as seen at the back, has disappeared; let it remain in for a minute or two longer, for if the whole of the undecomposed bromide of silver, which forms the unattacked portion of the plate, is not removed, you have another source of stains. To be fully certain of this, I employ two baths of hyposulphite, of equal strength, using them both for successive batches until the second begins to discolour; then replace the first by the second and make a

new one for the second. For the sake of economy, I keep for this purpose the fixing bath from prints (which may not be used for them a second time), the plate is lifted out of the first bath, slightly rinsed in water, and placed in the second until another plate waits to take its place. The extra time can do no harm, though a minute or two is generally sufficient. Now wash; and here no stress is too great to lay upon the fact that, unless all the hyposulphite is thoroughly eliminated from the film, the negative will eventually be spoilt.

Wash well in running water as long as convenient; then let the plate soak either upright or face downwards, for an hour or two with several changes of water.

Afterwards lay it in a clearing solution, composed of 1 oz. citric acid and 1 oz. of alum in 10 ozs. (½ pint) of water: this hardens the film and clears away any brown colour left by the hypo. A couple of minutes suffices for this; again wash, all night will do no harm, soaking, if the face be not left upwards, will do. If the surface of the gelatine be left upwards, of course, no change of water takes place, and very little good is done, whereas, if placed on edge, as in a grooved washing trough, made for the purpose, such as shown on page 17, chapter 2, the hyposulphite is dissolved out, falls to the bottom, being heavy, and fresh water acts continuously on the film.

Now drain and dry, without heat, by placing the negative on its edge, face outward, so that a current of air may pass over it, or if you want to dry quickly, it can be done by soaking the plate after draining for a minute or two in spirits of wine, the lighter spirits absorb the water, and there is now no danger in drying the whole before a fire or on a stove.

In all these operations avoid *fingering* the plate on the face. Grease spots prevent the action of liquids used and often produce marks which spoil the printing from the negative.

CHAPTER VII.

FAILURES AND THEIR CAUSES.

You can now judge if the negative is good or not. If good, you will find a small portion only very dense, a bit of sky or a shirt front; a small portion also clear glass or nearly so, in some deep shadow, such as an open window, a peep under the rocks, or in a figure the deep shadows in the clothing. All the rest, whether figure or landscape, should be full of graduated details. The whole of the sky should not be too dense; a white sky is objectionable, so is an uneven or dirty one. There should be some detail in the darkest shadows (except perhaps the bit before mentioned); the heaviest trees or the blackest velvet should all have gradations of blackness. If this is not so, either the picture is under-exposed or over-developed. If it be wanting in density, it is under-developed; if it is in parts very dense, it is under-exposed, if it be loaded in its detail, and is without density, it is over-exposed; if too dense all over, it is over-developed.

Transparent spots are sometimes found after developing. These show, if patchy, a defect in the gelatine; if like small pinholes, they arise from dust having settled on the surface of the film.

Round, half-developed spots with sharply defined edges show that air-bubbles have been allowed to accumulate

and prevent the action of the developer. Use the brush better, or break the air-bells as they form.

The edges of the plate may be frilled, shown by the thinness in parts, and lines of density spreading towards the edge of the plate; this is caused by the gelatine being soft. Keep the plate longer in the alum bath before fixing.

There may be a spot much more dense than the rest of the plate, most likely caused by pouring the developer on the plate in a stream on that one spot, instead of pouring it all round the edges quickly.

A patch of fog may appear in irregular shape on a portion of the picture; this arises from light being admitted into the camera, through some opening other than the lens itself; it may be a hole in the camera or in the bellows, or that the fronts don't fit tightly, or through the diaphragm slit, in the lens itself. Examine your camera well, find out, and remedy this, or keep it perfectly covered with the focus cloth during exposure of the plate.

Local fog or lines may be caused by the dark slides not being light-tight; look to this and always keep them covered while out of the bag or box in which they are carried.

If you use a changing-box there may occur a line, or several, right across the width of the plate, caused by the plate being thick, refusing to pass freely from box to slide or back again. Don't put thick ones in.

Fog all over may arise from great over-exposure, or from a wrong light in the dark room, from carelessness when putting the plates in the dark slide, or from using far too much ammonia.

Sometimes the plate is entirely fogged at one end, arising from accidentally pulling the shutter out of the dark slide a portion of the distance unprotected, or even the whole

slide with the shutter open may be pulled partly out of the camera.

If the plate seems stained yellow or brown, you have probably not used the clearing solution (citric acid, &c.)

If by reflected light it shows a green or red colour, this is caused by excess of ammonia in the development, especially when used without a corresponding amount of bromide.

If very large opaque spaces appear with a white or grey appearance at the back of the plate, it has not been fixed enough.

If the plate, after drying, has a dull whitish crystalline appearance on the film, it has been insufficiently washed.

If you have gone carefully through this work and attended rigidly to the minutest of the instructions given, you ought not to have any failures. No details have been given without an object, and nothing said which could well have been omitted, therefore, if error has arisen, you will find that somewhere or other the directions have not been followed.

CHAPTER VIII.

ON INTENSIFYING OR REDUCING DENSITY.

Well, good or bad, you have your negative, and perhaps find there is room for improvement.

The one defect most likely to occur is that it is too thin, either from over-exposure or under developing, though I have urged all throughout to use every means to get it up to proper printing density in the first development. Avoid intensification if you can. Try a print first and see (when it is finished, not when first printed) whether intensification is needed, and if it must be so, proceed as follows:—Make a solution of perchloride of mercury, 100 grains to 10 ozs. of water and allow the plate to soak in this until its surface bleaches to a pale grey colour. Take out and wash well, back and front, for a few minutes, and flood the plate with a weak solution of ammonia, 10 drops to the ounce of water, and again wash; this will change the colour to a deep brown or black, and on looking through the negative will be found more brilliant; this will also test the cleanliness with which you have worked. If it is stained or uneven, perhaps having a layer of yellow, or perhaps, in part not intensified at all, depend upon it you have not washed it sufficiently at some stage, most probably after fixing. The process may be repeated if necessary, and very great density obtained, but this is usually inadvisable.

If only a slight intensification is required, allow the

plate to soak in the mercury solution only until the surface begins to turn grey. The final density depends upon the length of time the plate is left in the mercury bath.

If you find that you have made it too dense, it may be reduced by soaking in hyposulphite soda ; or in the mercury solution, without adding the subsequent ammonia. In cases of very great contrast, the latter is the best and the plate then prints quickly.

Another plan of intensification is to soak the plate in a 2 per cent. solution of pyrogallic acid, return it to the cup and add a few drops of a mixture of 2 drams of acetic acid, 50 grains of citric acid, and 1 oz. water ; add to this in the cup a few drops of a solution of 20 grains nitrate of silver in 1 oz. of water, and continuing to add this until the required density is obtained. There is no fear of this changing afterwards as is the case with mercury, but there is fear of staining the plate with a red fog, and the operation is altogether a dirty one, both as regards plate, apparatus and operator, unless great care be used.

Mr. Edwards suggests the following :—

A Alum, 1 ounce.
Citric Acid, 1 ounce.
Water, 20 ounces.

B Saturated solution of protosulphate of Iron.

When required for use, 4 parts of A are added to 1 of B.

This solution not only clears the negative but slightly intensifies. The addition of a few drops of a 20 grain solution of nitrate of silver increases the density at will. There is no danger of staining the film, providing the negative has, by perfect washing, been freed from hyposulphite.

If the original negative be very thin indeed, a process first used by myself and afterwards recommended by others, will be found useful, as follows :—

After using the mercury solution as named first in this chapter, intensify with silver as described, and an image, which was almost invisible by transmitted light, will be brought up to full printing density. The mercury seems to form a basis for the silver to build upon, and is very powerful thus.

A slight, but clean, intensification is obtained by first bleaching as usual by mercury, but substituting a saturated solution of sulphite of soda for ammonia. This is specially suited to lantern slides.

If the negative has been over-developed and is found too dense, it may be reduced by a solution of perchloride of iron, 50 grains to 5 ozs. of water, and afterwards re-fixed in weak hyposulphite, and washed.

The negative may now be varnished by warming the plate and pouring over it the varnish, and when covered pouring back into the bottle the superfluous quantity, keeping the plate slightly moving till set, to avoid streaking in the direction of the flow, and dry before the fire; be careful not to pour too much on, or it will run over the plate disagreeably.

If only a few prints are required, the varnishing may be dispensed with entirely, or a thin coating of plain collodion may be flowed over the surface of the film, and allowed to dry cold.

CHAPTER IX.

RETOUCHING AND SILVER PRINTING.

The negative is now complete, as far as chemical means can make it. If there are transparent spots, paint them out with a very fine sable-hair pencil, using any dark opaque paint, or Indian ink. Scratches, if any, should be painted out as near the density of the missing part as possible.

Thin spots may be retouched by working upon them with a lead pencil. The surface of the negative must first be roughened somewhat, to allow the pencil to bite. This can best be done by using a drop of retouching medium, such as is sold, with instructions for use, by almost all photo-material dealers. If you have no medium, the part of the negative to be retouched may be roughened by rubbing with a little powdered resin, or very finely powdered pumice. The best pencil to use is one of Hardtmuth's or Faber's; a medium hardness, No. 3 or 4 or H. or H.B. suits most workers. Give the pencil an exceedingly fine needle-like point by carefully grinding it on fine emery paper, and then work over the thin spots with fine thin strokes, crossing or hatching them. Harsh tones, such as heavy shadows in the face, may be softened by this means, and the traces of wrinkles, freckles, &c., which show much more strongly in a photograph than in nature, may be removed. Successful retouching is quite an art by itself,

and months, or even years, of careful practice are required to become proficient, but much may be done, even by the amateur. The negative, during retouching, must be held so that the light falls through it. For occasional work it may be held against a window, but if any quantity of work is to be done, a retouching desk (fig. 12) with proper arrangements for reflecting the light through the negative, must be used.

Clouds may be painted in on the back, strengthened when already thin, or put in with the pencil on the face of the negative. An indication of a cloud, or a small bright

Fig. 12.

one to break up some heavy shadow, is frequently all that is wanted, unless it be to cover some defect in the sky. Moved figures may be sharpened; and in the shadows under the trees, fowl, and their reflections, may be painted or pencilled on the water. Many little dodges like this may be easily and effectively managed and will suggest themselves to the operator, for there are very few pictures so fully supplied with life or so perfect that a little care will not benefit them.

There are several processes of printing on paper, and

as they are all of them distinctly different, we must consider them separately :—The carbon, the platinum, the bromide, and the silver (or albumen paper) processes, of which the latter, being the general one, we will treat of first. The requisites will be :—Two or three printing frames, (fig. 13) the proper size of your negatives, some albumen paper, which is bought in sheets ready sensitized with silver, a good-sized porcelain dish for toning bath (which must be kept exclusively for this), another dish of the same size for fixing bath, some chloride of gold, or some gold solution ready prepared, hyposulphite of soda, a vignetting glass or two, some black paper masks, with cut centre openings,

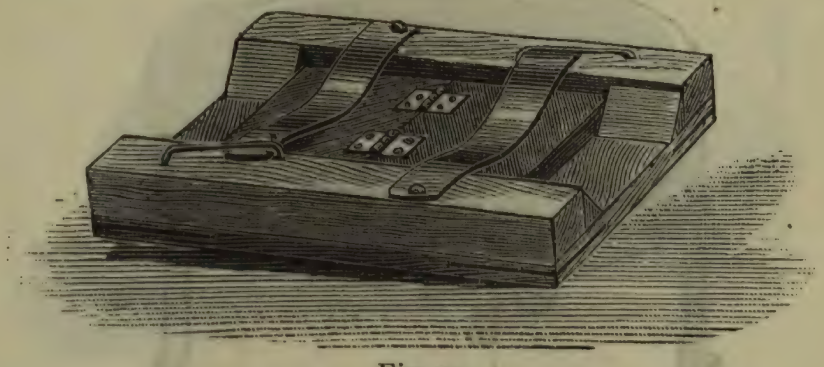


Fig. 13.

a glass guide for trimming the prints, a sharp knife, a slab of thick glass, for cutting on, and (what is not an absolute necessity, but most useful) an automatic tray or trough, for finally washing the prints. The circular print washer shown on next page works very well.

Now to commence operations, you must first cut up a sheet or two of the sensitive paper to the size you require. This is best done with a bone knife, and by gaslight or subdued daylight. Bear in mind that the paper, when damp, will stretch a little in the mounting, either in length or breadth according to the way in which it is cut. The following instructions will be useful :—

For Cabinet size :—Fold the sheet lengthways in three equal parts, and cut each strip into 5, this gives you 15 pieces all stretching in *length.*

For Cartes :—Cut each of the above into half, this gives 30 pieces, stretching in *width.*

For half plates :—Cut a strip of 4 inches off the sheet lengthwise, and this into 3, then fold the remainder into half lengthwise, and cut each fold into 5, this gives 10 pieces stretching in *length*, and 3 in *width.*

For ¼ plates :—Cut each of the above into halves and you have 26 pieces; 20 stretching in *width* and 6 in *length.*

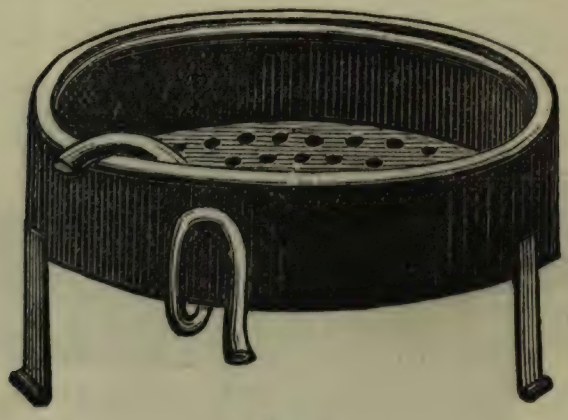


Fig. 14.

For 5 × 4 *plates :*—Cut a strip of 2½ inches off the bottom of the sheet, this will make 5 cartes-de-visite (stretching lengthwise) then the remainder of the sheet cut into 16, all stretching in *width.*

For 7½ × 5 *plates :*—The sheet cuts into 9 pieces, all stretching in width.

For larger sizes :—Take your negative and plan the mode of cutting without waste, by measuring on the surface of the paper before folding.

Touch the sensitive side of the paper as little as possible with the fingers; after cutting, it is best kept in a book of

blotting paper, tightly pressed so as to exclude air, or in a tin box with pressure-lid and spring (fig. 15), any way most convenient to protect it from the air and its deleterious contents.

After cutting your paper take out the back of the printing frame, by opening the springs, lay your negative in the frame with the film side upwards, put over it a piece of the sensitive paper, prepared side downwards, replace the back, fasten down the springs firmly, and place the frame on its edge towards a good light which will penetrate through the glass negative, and print on the paper pretty quickly. Thin delicate negatives print best in the shade,

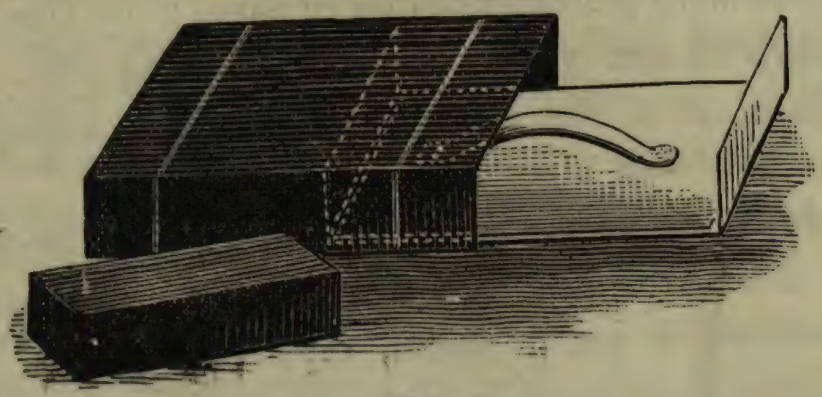


Fig. 15.

dense ones require a strong light, but avoid printing in direct sunlight; the quicker your prints are obtained, the quicker and better they tone. You must examine the paper occasionally so as to judge how far the print is progressing, by loosing one spring, and lifting up one half of the printing frame back, and then replace it if not done enough.

The printing must always be prolonged until the print is somewhat darker than you would like it to remain, as the subsequent toning and fixing brightens it considerably.

When you consider the print is dark enough, remove it from the frame, put it in a box or book away from the light,

and begin afresh with another piece of paper, and so on until you have the number of prints you require, and they may all, if stored away from light, remain some days until you have sufficient to tone a dozen or two together, although *very* long keeping before toning is apt to injure the purity of the tones a little.

When printed, the pictures should be trimmed; that is, cut to the size they are intended to remain. It is more economical to do this before toning, as it saves gold; though many prefer to cut them after, as the result can be better judged. The trimming should always be done with a sharp knife and a glass shape, which for leading sizes may be bought, or with a straight-edge of steel; by this means you are sure to get your picture square and nice, a most important feature in the appearance when mounted. No picture can look well if not cut true.

If the sky is clear and white, clouds may be printed in (after the landscape and before toning) from a separate negative, which, if not at hand, may be bought; waxed paper negatives are good, useful, and cheap. During this operation the picture must be masked, either by a sheet of opaque paper cut out to the sky-line (a spoilt print answers the purpose best, having the sky-line already drawn on it), or a handkerchief or cloth roughly folded to the shape. The mask, however, must prevent the already printed picture from being again exposed, and also by movement prevent a harsh line from being formed where the shadow is cast. Constant movement of the cloth, carefully performed, does this well.

If you have a frame large enough, the print, after being removed from the original negative, may be thus exposed under the cloud negative. If your printing frames are only

the size of the glass, make a temporary one, by a large piece of glass and a back board from an ordinary frame, and hold the whole in your hand. A little experience is necessary to put clouds in well, but there is no difficulty about it.

Sometimes if the sky is very thin or dirty, it is better to paint the whole of it out in the negative, so as to get a perfectly white sky, and then print clouds in at will.

The toning solution is prepared as follows :—

1 grain Chloride of Gold.
30 grains Acetate of Soda.
8 ounces of Water.

Mix and keep for two days before using. The solution can be used over and over again, adding fresh gold after each toning. The gold, bought in tubes of 15 grains, is best dissolved in 15 drams of water, thus one dram is equivalent to one grain. It is usual for one whole sheet of paper to take up one grain of gold when used in large quantities, therefore, the amount of solution made is regulated by the number of pictures and their size. For small quantities you must use more gold in proportion. Having made your toning solution, and toned say as many pictures as are cut out of a half sheet of paper, then, before putting away add a dram of gold solution, which is as much as you have extracted. It is then ready at once for the next batch of prints.

Many prefer to make a fresh lot of toning for each batch, and immediately before using, thus :—

1 grain of Gold.
4 grains Bicarbonate of Soda.
8 ounces of Water.

This may be used in two or three hours after mixing, or as soon as the yellow colour of the solution has changed to

a pale green, or is almost colourless. It is inadvisable to use this a second time, except immediately after.

Take the prints and soak in clean water for a few minutes, then subsequently in two or three changes of water. Then immerse each print singly in the toning solution. Keep all moving, and separate each from time to time, to allow fresh gold to act on every portion freely. It will require from ten to thirty minutes, according to varying circumstances; the temperature influences the duration of time; a cold solution acts slower than a warm one; and, as previously stated, a slowly printed picture tones slowly. Each print must be left in until it assumes a purple or rich brown tint, and, when held up to the light, shows no red colour by transmitted light. When this is so, the prints may be taken out of the toning and put in some plain water, in which a pinch of salt, quantity not important, has been dissolved. This prevents the action of the gold while waiting until the remainder are finished. These operations may be conducted in a subdued daylight, but a strong light will injure the brilliancy of the result.

When all are toned, they are fixed in a solution of hyposulphite of soda rather weaker than that used for the plates, viz., 2 ozs. of hypo. to 20 ozs. or 1 pint of water. The addition of a few drops of ammonia, say twenty or thirty to the pint of water, will often prevent the prints blistering. Dissolve hot, but allow to go quite cold before using, and this must be made freshly for each batch of prints. They are left in this for ten minutes in summer, fifteen in winter, using the same precautions as mentioned above, to keep each separated, so that the hyposulphite may act freely. Then wash thoroughly in many changes of water or in running water, for twelve hours; if you

possess one of the washing troughs, which I previously named, attach by an india-rubber tube to a water tap, put in the prints, and let the water run all night, then in the morning take out, dry them between blotting paper until they are just limp, and they are ready for mounting.

"Aristotype," a paper which is coated with a gelatino-chloride emulsion, is much admired by many people for its rich, warm tones, and the brilliant surface which can be given to it. The printing is done just as with ordinary silver paper, and special instructions for toning may be obtained with the paper. We should advise the beginner to give the maker's formulæ a trial, though we have obtained excellent results by toning in a tungstate bath of good strength, viz. :—

Tungstate of Soda	30 grains.
Gold Chloride	1 grain.
Water	4 oz.

The use of an alum bath, before toning, will assist in obtaining evenness of tone, and to aid the same result, care must be taken to properly immerse the prints when first placing them in the toning, and to keep them constantly in motion. Extreme care must be taken to prevent the toning being contaminated with hypo. When the prints are sufficiently toned, lift them from the toning with the right hand, transfer them to the left, and with the left place them in the fixing bath, which will be the same as for silver prints. If the prints are allowed to dry spontaneously they will have a bright surface, but if great brilliance is desired, they should be squeegeed while wet on to a prepared ferrotype plate, or on to a piece of waxed glass or oiled ebonite, from which they can be stripped when dry.

CHAPTER X.

THE BROMIDE AND PLATINOTYPE PROCESS.

While the "silver printing," of which I treated in the last chapter, is undoubtedly the most generally popular, and likely long to remain so with beginners, on account of its comparative simplicity, there are other printing processes which possess certain advantages of their own, and with which the amateur will probably wish to experiment.

The bromide paper process is the one most likely to be first taken up. It has one drawback, in that the image cannot be seen after printing, but has to be developed, so that the necessary exposure must be judged as in the case of exposing a negative. As the exposure is done in the printing frame, in the dark-room, there are no varying stops to calculate for, and a standard light may be used; so that the only "variable quantity" is the density of the negative. The bromide papers sold by different manufacturers vary in their rapidities, but we may take as a standard for contact printing the Eastman paper, or the Ilford "slow." Precautions against exposing to white light must be taken as in the case of dry plates. Place the paper in the printing frame with the prepared side towards the negative, and expose it to the light of an ordinary No. 3 gas burner at a distance of three feet for about 20 seconds. Of course, the exposure will vary according to the density of the negative. Development proceeds in the same way

as with dry plates, excepting that, of course, the result is a positive and not a negative. As pyro development would stain the paper, and otherwise is not so suitable as ferrous oxalate, the latter developer is used. There are many formulæ, but the following, given with the Ilford bromide paper, answers as well as any. The prints, after being exposed, should be allowed to soak in clean water for a few minutes before being placed in the developer, which s thus prepared:—

No. 1.

Neutral Oxalate Potash.....	1 lb., avoirdupois.
Warm Water	64 ounces.
Bromide Ammonium	20 grains.

Filter.

No. 2.

Sulphate Iron	1 lb., avoirdupois.
Warm Water	48 ounces.
Citric Acid	½ oz., avoirdupois,

Filter.

For use add 1 ounce of No. 2 to 5 ounces of No. 1. Do. not add No. 1 to No. 2; this would cause a precipitate. After development, and without washing, immerse the prints in the following clearing solution for a few minutes:

Alum	4 ounces, avoirdupois.
Citric Acid	1 ounce, ,,
Warm Water	80 ounces.

This solution must be changed for every few prints. Then rinse in three or four changes of water, and fix in fresh hypo. solution.

Hyposulphite of Soda	1 lb., avoirdupois.
Water.....	80 ounces.

And wash in the usual way. In very hot weather it may be desirable to soak in an alum bath after fixing; for this purpose be sure no other chemical is mixed with the alum,

and it is important that the prints should have been washed in several changes of water after the hypo., before putting into the alum. Take care that the hands and dishes are clean. The slightest trace of chemicals conveyed to the solutions by contaminated hands would be fatal to good results. If blisters appear after fixing they may be avoided by immersing the prints after fixing (without previous washing) in a bath of common salt and water.

Platinotype prints are very much admired on account of their beauty of tone, which is much colder than the tone of the ordinary silver print, and have the great advantage of being permanent. The platinotype process is patented, and the prepared papers and all materials may be obtained from the Platinotype Co., Southampton Row, W.C. Two processes, the hot bath and the cold bath, are worked, but we shall only describe the former, as it is the one recommended by the company. The paper must be carefully protected from any damp, which is best done by keeping it in a "calcium tube," an air-tight tin case with a false bottom containing calcium chloride. When the calcium becomes at all damp, it must be taken out of the tube, placed on a tin and heated for some time in an oven, to thoroughly dry it.

The negative should be a good, vigorous one, and if stored in a damp place, should be dried before printing. The paper is placed behind the negative, and covered with a dry pad of sheet india-rubber or water-proofed cloth. The principal difficulty is to know when the paper is sufficiently printed, as the image is not printed to full strength. The time required is less than for silver paper, and a pale brownish image is all that becomes apparent. When this has all the details faintly visible it may be said

to be printed far enough, and practice will soon ensure a correct judgment.

For development make a solution of about two ounces oxalate of potash in seven ounces of water. This can best be dissolved if the water is hot. Test the bath with litmus paper to see if it is slightly acid, and if so, add a very small quantity of carbonate of potash, until it shows a slightly alkaline re-action. The developing dish must be of enamelled iron, and should be placed over a gas-ring or rose burner, so that the solution may be kept at an uniform temperature of 180° Fahr. This is the temperature for normally exposed prints. If they are over-exposed, ten or twenty degrees lower temperature will ensure better development, while if they are under-exposed, a much higher temperature may be required to develop good prints. The prints must be placed face downwards; five to ten seconds will complete the development.

After development, the prints must be "cleared" by washing in several baths of dilute hydrochloric acid (1 oz. in 60 ozs. of water). When the clearing bath becomes somewhat milky, slightly more acid is needed. After the clearing, wash in cold water.

Capt. Pizzighelli, an Austrian scientist, has introduced a platinotype paper which prints out, and which requires no development, but simply the clearing. Several processes of toning albumenized silver paper with platinum are also being used to some extent.

CHAPTER XI.

MOUNTING PHOTOGRAPHS.

Much taste can be displayed in this matter, both as to style, colour of mount, size of margin, &c. A pale cream buff, or French grey tint will suit a vignetted picture, whilst darker tints, such as olive or black, may be used for photographs of a deeper general tone. A contrast between the tint of the mount and the photograph always sets off the latter to advantage, and therefore, I consider a chocolate colour in the mounts most undesirable, though I know they are used—however, *chacun a son gout*. Gold bevelled edge mounts, which may be had in a variety of suitable tints, are very effective for all pictures of small size—such as cartes, cabinets, &c.

The simplest mountant is starch. Special pastes and mountants are sold by some dealers, which possess the advantage of always keeping sweet and ready for use. If the print is much cockled or crushed, it had better be re-soaked in clean water until limp, and partially dried between sheets of blotting paper.

Always mount your prints in this state, as they dry much flatter by gently rubbing down with the hand, or a squeegee, and letting them dry spontaneously, after which, to complete your picture, spot out with a brush and Indian ink, or sepia, any slight defects; this will frequently be necessary if the negative was originally defective.

If a higher gloss is preferred on either the mounted

or unmounted prints, they are usually passed through a hot rolling press, or a burnisher ; the ordinary kind, costing about 7/6 for a cabinet size, requires to be heated, and upon the right temperature depends to a great extent the finish of the surface given.

A burnisher is undoubtedly a desideratum, though not an absolute necessity ; and it requires to be carefully used.

A pretty form of mount for photographs to hang on the wall or stand on the mantel-piece, is what is known as optical contact mounting. There are various forms of circular and oval rims with backs and glasses or plain bevel edged glasses with struts, sold by all dealers for this purpose. The method of working is as follows :—The print when perfectly dry is trimmed to the shape, and a little less than the size of glass, which must be carefully washed, then kept in a dish of water at a temperature of about 100° ; then prepare a solution of gelatine (1 part to about 12 parts of water), place this in another dish and keep at the same temperature, in which immerse the prints as you trim them. Take a piece of strong level glass of good size, with a thick piece of paper pasted down upon it to form a table or bed, an india-rubber squeegee, and a clean cloth. Now to mount the print, take a glass from the hot water dish, just draining off superfluous water, lay it on the glass bed, take a print from the gelatine solution, lay it face downwards on the glass, press gently down to its proper position, drain off any excess of gelatine, and smooth down into close contact by the squeegee, then set aside to dry, after which frame it in the metal rim, insert the back, bind the back edge of it with a strip of adhesive paper to exclude the air, and it is then finished.

CHAPTER XII.

MAGIC LANTERN SLIDES, OPALS, ETC.

One of the pleasantest branches of photography is its use in the production of lantern slides, more especially since gelatine plates are now prepared in such perfection for this purpose that, with care, transparencies of good quality may be produced.

I dare say that many of my readers possess an optical lantern, and if so, they will not only find it useful in producing the enlarged photographs referred to in another chapter, but also as a winter evening's amusement, for exhibiting enlarged views of mountain, sea, or land, which have been photographed during the summer's rambles; or for the family portraits, groups, and other domestic pictures which have been obtained by the camera, and which are sure to form a large number in an amateur's stock of negatives. These being reproduced in the form of lantern slides by a very simple process of contact printing and development, are always interesting to your friends—when they can see them depicted upon the screen "as large as life, and quite as natural." The process I will explain as concisely as possible in this chapter.

Firstly, you must procure some of the sensitive plates, $3\frac{1}{4}$in. × $3\frac{1}{4}$in., or you can make the proper size by cutting 1 inch off the usual quarter-plate, but it is advisable to obtain the correct plate from the manufacturer, because

they are made from a specially prepared emulsion, and upon a suitably thin glass, so that when finished, the lantern slide will not look thick and clumsy. Having procured these, you must now select one of your printing frames with a pretty deep rebate, and place your negative in the usual way within it, *i.e.*, with the film side upward; take it into the dark room, and under ruby light place one of your lantern plates, prepared side downward, upon the part of the negative which you wish to reproduce as a slide, first taking care that you have removed any speck of dust from the negative and the plate, by brushing their faces lightly over with a soft camel's-hair brush or a silk handkerchief, before placing the two plates in contact, then insert the back of the printing frame and press it down with the springs, so that perfect contact is insured. This is, if anything, more important than when printing upon paper, because the latter is of a yielding nature, whilst your glass lantern slide is not. Now expose the face of the printing frame, so as to print through the negative, to the light of an ordinary gas flame or a paraffin lamp, by holding it in the hand, about 12 or 14 inches away from the light, so that the whole surface of the plate is equally illuminated for 4 or 6 seconds only. Development must be done by the ferrous oxalate method, and the tray must be used for this purpose only.

The best formula I have met with for developing these transparencies is as follows :—

Mix in two separate bottles.

IRON SOLUTION.

Protosulphate of Iron, pure, 4 drams.
Hot Water, 4 ounces.
Dissolve and use cold.

OXALATE SOLUTION.

Neutral Oxalate of Potash, 2 ounces.
Bromide of Potassium, 5 grains.
Hot Water, 8 ounces.
Dissolve and use cold.

For making the developer, take one part of the iron solution and two parts of the oxalate solution, mixed in sufficient quantity to well cover the plate, pour it deftly over the suface of the plate in one wave, and then by a continuous rocking movement of the tray in the hand, keep the solution flowing backward and forward on the surface until development is completed. You will find a faint image very soon appear, the strongly-lighted portions coming out later, and the picture will very gradually increase in strength; continue developing so long as detail is apparent in the deepest shades, and just so long as the high lights remain perfectly white; but should they show a tendency to veil over or discolour, then pour off the solution, rinse the plate in cold water and place it in the fixing bath freshly made (hyposulphite of soda 4 ozs., and 1 pint of water) to clear and finish at once. Let the plate remain in this fixing bath until perfectly brilliant, then wash it thoroughly in cold water for some time and set upon its edge to dry, the same as you would a negative.

If you should now find the transparency very thin, and wanting in due contrasts of light and shade, it shows over-exposure; if, on the other hand, it is wanting in clear details in the deeper shades, it shows under-exposure. The remedy which can be applied in future exposures is obvious in either case. Supposing that your picture is perfect, *i.e.*, bright, clear glass in the high lights, full of delicate detail in all other parts, and with plenty of contrast, you may then, after it is dry, look it carefully over,

and touch any little imperfections upon the film with a lead pencil, then coat over the surface with a very pale, thin varnish. Take a piece of perfectly clear thin glass, the same size as your plate, viz., $3\frac{1}{4} \times 3\frac{1}{4}$, and put over its face, placing between the glasses a thin black paper mask, with a cut aperture, bind all the edges of the two plates closely together with strips of gummed paper and your slide is complete.

You should always recollect that when exhibiting your picture in the lantern, and it is enlarged to several feet in diameter upon the screen, it will show every small imperfection in the slide, therefore it should be produced microscopically sharp, and with fullest amount of vigour obtainable in development, as it cannot well be improved afterwards.

The opal is another and very beautiful form of photograph, suitable for framing as a picture, or as a transparency for hanging in the window, so that the light is transmitted through it, or for the ornamentation of hall lamps, and many similar purposes. It is produced by direct contact printing from the negative, or by enlargement in the camera to any required size on sensitized opal plates.

The directions given in this chapter for producing lantern slides apply equally to bromide opals, but even greater care is necessary that you do not expose too long to the light, otherwise you will be very much restricted in the latitude allowable for fully working out the picture during a long development, when the whites and half-tones will probably be degraded before the deeper tones are fully developed. The same formula is used (ferrous oxalate) and you must exercise judgment in its continuance until the required strength or force in the picture is obtained, and so

long as the highest lights in the subject remain perfectly white, but the moment that a tendency is shown in these portions to veil over, the development must be stopped, the plate rinsed in water, and fixed in the hyposulphite bath, where it may remain a considerable time after clearing; the resulting picture should be soft, yet vigorous, and it may be improved in brilliancy if soaked for some time in a solution of citric acid and alum, equal parts, say 1 oz. of each in 10 ozs. of water.

These opals if printed by contact to the same size as the original negative will rarely require any touching up or artistic work upon them, but they may be coated at once with a pale transparent varnish, and are then ready for framing. Of course, the whole operation must be performed in the dark room.

Chloride opals, which are printed out, and toned and fixed exactly like silver-paper, may be obtained; and as they can be examined during printing, require no development, and give rich warm tones, they are preferred by many to the bromide opals.

CHAPTER XIII.

INSTANTANEOUS PHOTOGRAPHS.

A few remarks on instantaneous work may not be out of place.

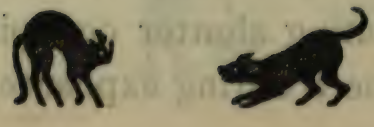
A so-called instantaneous picture may be taken in half a second, and there have been times when I have failed to get sharpness in $\frac{1}{60}$th of a second. So much depends upon the conditions, upon the movement of the object and your own, that it is difficult to give any reliable data to go upon.

Shutters are used in various positions, in front of the plate, behind the lens, inside the lens mounts, outside the lens, and outside and independent of camera and lens.

In theory, the best is between the lenses if a compound one, or behind the lens if a single one. The aperture between the lenses is smaller than that outside, and therefore the shutter may be made less cumbersome, besides, with this form of shutter all the rays of light collected by the lens are utilised in producing the picture, which is not the case when a shutter is used on the front of the lens; this is an important consideration. A shutter which opens at once fully from the centre, and remains open for a much longer period than it takes in opening, is the best kind. Many begin to close as soon as they are fully open, allowing the full work of the lens only for a small portion of the exposure. The rotating shutter occupies little space, and does not jar the camera during exposure.

The drop shutter is the simplest, and most easily made. It consists solely of a long piece of brass, a hole in the centre and sufficient metal at each end to act as a cap. It opens and closes by liberating a spring catch. The open space in centre should not be less than the diameter of the lens. Mine is twice that size, so that in effect it remains open even when falling; it works between the lenses and is therefore even for a large lens not more than 8 inches long, *i.e.* 4 inches of opening and 2 inches of solid metal. As regards lens, &c., to be used in connection with instantaneous work, half a second is the longest exposure you can expect to give, and get good results; therefore the rapidity of the plate and the light must determine what lens to use. The rapid rectilinear works in sunshine in $\frac{1}{24}$ of a second, so that you can use a quick shutter with this, or stop down the lens and use a slow one.

There are several cameras made purposely, and called detective—a misnomer; to be detective, the appearance of a camera must be hidden from the public. Mr. Bolas was the first to introduce this in a box form; I have made one working inside a courier bag. Many other forms of "detective" camera are on the market, and one or more may be seen in most dealers' stocks.



CHAPTER XIV.

ON ENLARGING AND REDUCING.

The only negative worth enlarging as a rule is one full of detail and soft, that is, full of gradations without the high lights being too intense.

From such a one you may either take an enlarged transparency direct, or a small transparency, and then enlarge to a negative.

In either case attend to the instructions given for lantern slides as regards development, &c.

The small positive, as it is sometimes called, may be taken by the camera, or by contact with the negative in the printing frame. In the first case you may use daylight, in the second artificial light is best, as being more under control. If the negative is not a large one, I prefer to copy in the camera to a lantern size, as it may then be utilised for lantern work afterwards. To enlarge from this, if you have no other means, it is possible to do it in an ordinary lantern, focussing on a sheet of paper and then substituting the dry plate. The proper way is to have an enlarging camera, which a handy man may make, leaving out the bellows if too troublesome, and using any other means he may think best for obstructing extraneous light. The camera is simply an enormous copy of the usual apparatus with a dark slide big enough to hold the largest plate likely to be used, and carriers for smaller plates. It is

generally fixed on a large plank for base board, and on the same board in front of lens a movable framework to hold the negative. If the camera extends to say 5 ft., the size of the resulting picture depends entirely on the angle of the lens, the shorter focus and therefore wider angle naturally giving the larger result.

The exposure depends so much upon circumstances, that it is impossible to give any rule, but you can generally calculate roughly for a trial picture with a small plate; thus, if the camera is drawn out to 4 feet, and a lens with a

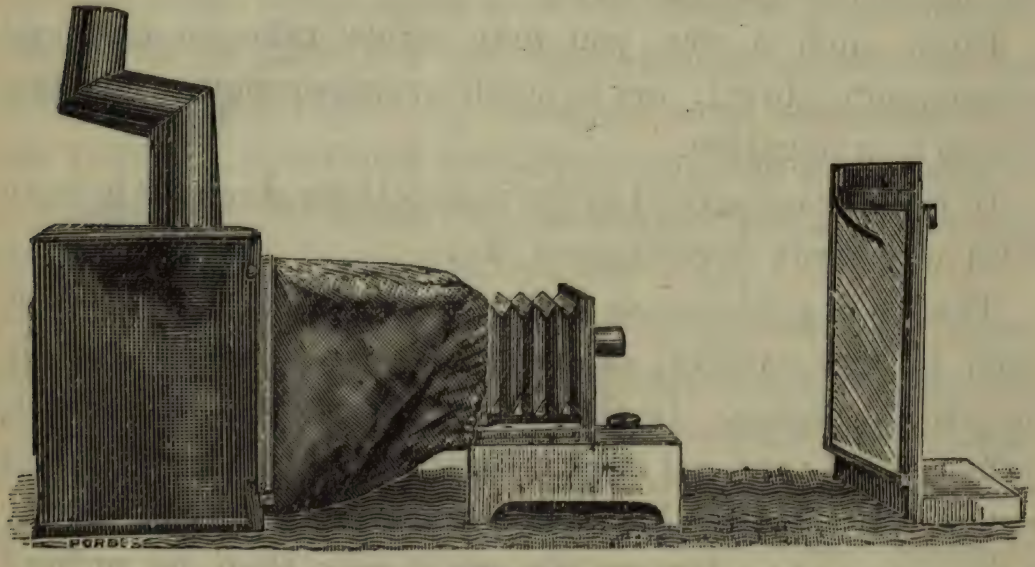


Fig. 16.

$\frac{1}{2}$-inch stop used, you divide the 4 feet by $\frac{1}{2}$-inch and get *f*/96, so that by adopting the plan I have before given in calculating exposures, you have one data to go upon. The question of light is entirely dependent on its source; if you point it to the sky, the exposure may only be 3 or 4 seconds, according to the density of the negative; if to a reflection, more; if to a ground glass window, still more; if to an artificial light, very considerably more, and so on. The development is as usual. Always experiment with a smaller plate first.

To reduce negatives, the same plan is adopted as above, only that the ordinary camera is used; in each case care must be taken to have the original negative *equally* lighted, by placing ground glass or tissue paper at some distance behind.

If you wish to produce a direct enlargement upon bromide paper, or opal, without first making a transparency, it is easily done by printing directly through the negative with one of the simple lanterns shown on opposite page (fig. 16).

The source of light is here a duplex paraffin lamp, the front of lantern is fitted with a carrier frame in which you insert the negative, with a piece of tissue paper behind it to diffuse the light, then attach your own camera and lens to the flexible bellows at front of lantern: focus the subject carefully upon a piece of white paper attached by drawing pins upon the wood stand placed at a sufficient distance away to give the dimensions of picture you require; cap the lens, remove the piece of white paper from the stand, replace it with the piece of bromide paper (or opal), then make the exposure. The time requisite for this depends upon the character of the negative and also of the sensitive paper you are using; full directions are usually given by each maker, as also for the after developing, which is always by the ferrous oxalate process.

CHAPTER XV.

RECOVERY OF SILVER, ETC.

In the practice of photography, amateur or professional, it would be strange if there were no waste materials arising from failures in working, or other causes over which you have probably no control :—*i.e.* a box of dry plates may have become useless from accidental exposure to light, to damp, or to the curiosity of inquisitive eyes, or your sensitive paper may have become unfit for use from long keeping, but beyond this there must necessarily be an amount of waste products, small or great, from the most successful working, and as these waste products contain some of the precious metals—silver and gold—it is worth while knowing how to recover them, or rather *the silver* (for the gold is not worth attempting), if only for the sake of experiment. All undeveloped dry plates contain bromide of silver in the films ; all untoned sensitive paper contains chloride of silver in the albumen ; all hypo baths used for fixing plates or prints, contain some silver, as also does the first water used for rinsing the prints before toning ; these are worth keeping, and silver may be recovered from them by either of the following methods :—

Throw all such solutions or gelatine films into a large jar or tub containing at the bottom some metallic zinc. The silver is after a time deposited on the zinc, when the

superfluous liquid may be poured off to make room for another lot containing more silver; or

From the waste solution of hypo:—The silver may be precipitated by sulphide of ammonium or of potassium, as a black sulphide of silver; but the odour is not that of roses, and may be objected to by some. The wash water from the prints may be treated with a little common salt, when the silver is thrown down as chloride.

To these precipitates add also the burnt cuttings from untoned prints (when fixed they are not worth saving).

By whichever means the silver is saved it is best kept until a large quantity is obtained, when any refiner will reduce it to the metallic state or purchase the whole. If only a few plates, and those small ones, are occasionally used it is not worth the trouble to try and economise in this way; far rather use the extra labour on the plates themselves. The saving will be much greater.

You will find at end of book there are two pages of blank paper left, on which to make memoranda of anything that strikes you as important. Such memos. are very frequently of great value for future reference, and will bear conning at times of difficulty. Addresses, &c., may also be noted down, or pages of books or journals, where some new or important information may be obtained.

One more piece of advice—take some photographic periodical, and if near enough to one, join a Photographic Association, and give your improvements to the world as freely as you find others have done. It is through amateurs the world has always been benefitted. Don't be content with the information given in this little Handbook, it is only intended as a first stepping-stone towards learning the beautiful art-science of photography, and I need scarcely

add, that it has been written with the sole view to *instruction*, and not for the purpose of recommending or selling the goods of any manufacturer, the very mention of which I have studiously avoided, where possible.

FRONTISPIECE.

With the rapid advance of photographic art, the adaptation of photographs to book illustration has followed as a matter of course. The delicacy of detail, and truth to nature which we find in a photograph, cannot be rivalled by any process of mere draughtsmanship, and these qualities are of immense importance for many purposes of illustration. The cost of ordinary photographs, whether silver-prints or prints made by any other process of pure photography, the slow rate at which they can be produced, and the difficulties connected with finishing, mounting and binding them in quantities, prevents their use except for small editions of expensive works; and in order to combine as far as possible the advantages of photography with speed and economy of production, several photo-mechanical and photo-chemical processes have been invented. Of these, photo-zincography is by far the most generally employed, because it can be used in connection with the type, in letterpress printing. Our frontispiece is an excellent example of the highest class of photo-zinco work, and is printed from a block produced from a very excellent photograph by Mr. F. M. Sutcliffe, of Whitby. The block is one of sixteen used in the illustration of "The Ocean of Air," a work on popular meteorology published by Messrs. Seeley & Co., of Essex Street, Strand, W.C., to whose kindness we are indebted for permission to use the block.

WEIGHTS AND MEASURES.

Apothecaries' weight is adopted in formulæ. Chemicals are sold by avoirdupois weight.

APOTHECARIES' WEIGHT.

SOLID MEASURE.

20 Grains	= 1 Scruple	=	20 Grains.
3 Scruples	= 1 Drachm	=	60 ,,
8 Drachms	= 1 Ounce	=	480 ,,
12 Ounces	= 1 Pound	=	5760 ,,

FLUID.		Symbol.
60 Minims	= 1 Fluid Drachm	f. ʒ
8 Drachms	= 1 Ounce	f. ℥
20 Ounces	= 1 Pint	O. ℥
8 Pints	= 1 Gallon	gall.

AVOIRDUPOIS WEIGHT.

27⅓ ½ Grains	= 1 Drachm	=	27⅓ ½ Grains.
16 Drams	= 1 Ounce	=	437½ ,,
16 Ounces	= 1 Pound	=	7000 ,,

FORMULÆ.

A few of the newest and most approved formulæ, are here given for developers, toning solutions, etc.

ALKALINE PYRO DEVELOPER.

No. 1 Solution.

Pyrogallic Acid	64 grains.
Pure Citric Acid	6 ,,
Cold Water	4 ozs.

No. 2 Solution.

Liquor Ammonia 880°	1 dram.
Potassium Bromide	30 grains.
Soda Sulphite recryst	2 drams.
Cold Water	4 ozs.

For use, mix 1 dram of each solution in about 1½ oz. of cold water.

ANOTHER IN 2 SOLUTIONS.

No. 1 Solution.

Pyrogallic Acid	1 dram.
Alcohol (pure)	6 drams.
Glycerine (pure)	1 dram.

No. 2 Solution.

Potassium Bromide	10 grains.
Liquor Ammonia, 880°	1 dram.
Glycerine (pure)	1 ,,
Cold Water	6 drams.

For use, dilute each solution 1 part to 15 parts of water, and then mix equal quantities of each.

ANOTHER IN 3 SOLUTIONS.

No. 1 Solution.		No. 2 Solution.	
Pyrogallic Acid...	1 oz.	Liquor Ammonia, 880°	1 oz.
Citric Acid (pure)	40 grains.		
Cold Water	6 ozs.	Cold Water	1 oz.

No. 3 Solution.

Potassium Bromide	2 drams.
Cold Water	1 oz.

For use, add 12 minims of No. 1 to 2 minims of No. 2, and 1 minim of No. 3 to about 2 ozs. of cold water, as a normal developer, and afterwards add a little more of either solution as may be necessary.

FERROUS OXALATE DEVELOPER.

Iron Solution.

Protosulphate Iron	4 drams.
Warm Water	4 ozs.

Oxalate Solution.

Potash Oxalate (neutral).....	2 ozs.
Potassium Bromide	5 grains.
Warm Water	8 ozs.

When cold, mix 1 part of Iron to 2 parts of Oxalate Solution immediately before using.

BEACH'S POTASH DEVELOPER.

Pyro Solution.

Soda Sulphite recryst	4 ozs.
Hot Water.....	6 ozs.

When cold, add—

Acid Sulphurous	3¼ ozs.
Pyrogallic Acid.....	1 oz.
Cold Water to make up	10 ozs.

Potash Solution.

(*a*)	Soda Sulphite recryst	2 ozs.
	Hot Water	4 ozs.
(*b*)	Potash Carbonate.....	3 ozs.
	Hot Water.....	5 ozs.

Mix these two together, and cold water to make up 10 ozs.

For use, mix 20 drops of Pyro, and 30 drops of Potash solution with about 1 oz. cold water.

THOMAS'S HYDROKINONE DEVELOPER.

Take of	Hydrokinone	160 grains.
,,	Sodium Sulphite	2 ounces.
,,	Citric Acid	60 grains.
,,	Potassium Bromide	30 grains.
,,	Water to	20 ounces.

,,	Sodium Hydrate	160 grains.
,,	Water to	20 ounces.

Use equal parts of each Solution. This will develop many plates in succession.

CLEARING SOLUTION.

Citric Acid (pure)	1 oz.
Powder Alum (pure)	1 oz.
Cold Water	10 ozs.

INTENSIFYING.

(*a*)	Perchloride Mercury	80 grains.
	Hot water	4 ozs.
(*b*)	Liquor Ammonia, 880°	2 drams.
	Cold Water	4 ozs.

First immerse the negative in solution *a* (when cold) until it is bleached, rinse well in water, then immerse in solution *b* until properly dense, after which wash copiously. Solution *a*, label "*poison.*"

ANOTHER INTENSIFIER.

(*a*)	Citric Acid (pure)	4 drams.
	Alum Powder	4 ,,
	Cold Water	10 ozs.
(*b*)	Iron Protosulphate	1 oz.
	Warm Water (to saturation)	4 ozs.
(*c*)	Nitrate of Silver	20 grains.
	Cold Water	1 oz.

For use, add 4 parts of solution *a* to 1 part of solution *b*, and add a few drops of *c* when required.

REDUCING.

Iron Perchloride	40 grains.
Cold Water	4 ozs.

OR ANOTHER.

Acid Hydrochloric (pure)	10 drops.
Cold Water	4 ozs.

FIXING SOLUTION FOR NEGATIVES OR PRINTS.

Soda Hyposulphite	4 ozs.
Cold Water	20 ozs.

This must be freshly made for prints after toning.

TONING BATHS.

Gold Solution.

Chloride of Gold	15 grains.
Cold Water	2 ozs.

Acetate Bath.		Borax Bath.	
Soda Acetate (pure)	30 grains.	Borax	40 grains.
Gold Solution	1 dram.	Gold Solution	1 dram.
Cold Water	8 ozs.	Cold Water ...	8 ozs.

Carbonate Bath.		Phosphate Bath.	
Soda Bicarbonate	5 grains.	Soda Phosphate	20 grains.
Gold Solution ...	1 dram.	Gold Solution...	1 dram.
Cold Water	8 ozs.	Cold Water.....	8 ozs.

CONCENTRATED GOLD BATH, WHICH WILL KEEP WELL.

Chloride of Gold,	15 grains.	Soda Bicarbonate,	5 grains.
Soda Acetate (pure)	90 ,,	Cold Water	4 ozs.

This contains about ½ grain of gold in each dram of the solution, and must be diluted for use in proportion of 1 oz. to 8 ozs. of water. It should be made 24 hours before using. After each toning add a little more of the concentrated solution to the bath about ten minutes before use.

DEVELOPER FOR EASTMAN'S BROMIDE PAPER.

No. 1 Solution.

Oxalate of Potash ...	16 ozs.	Hot Water	48 ozs.

No. 2 Solution.

Protosulphate of Iron	16 ozs.
Hot Water	32 ozs.
Sulphuric Acid	½ dram.

Test with blue litmus paper, which should be turned distinctly red.

No. 3 Solution.

Bromide Potassium...	1 oz.	Water	32 ozs.

These solutions, keep separately, and must be mixed *only* for immediate use. Take in a suitable tray—No. 1, 6 ounces; No. 2, 1 ounce; No. 3, 1 dram.